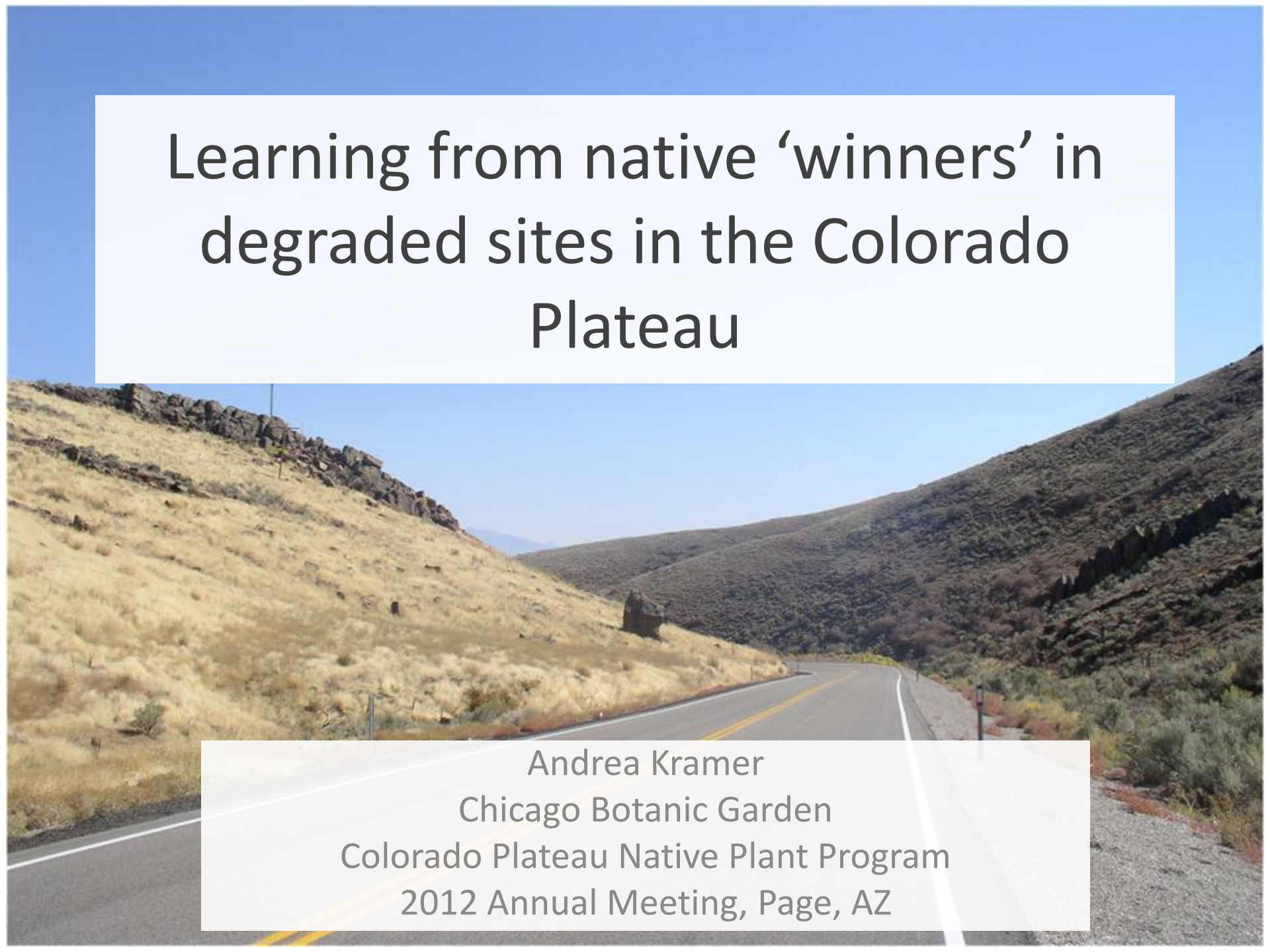


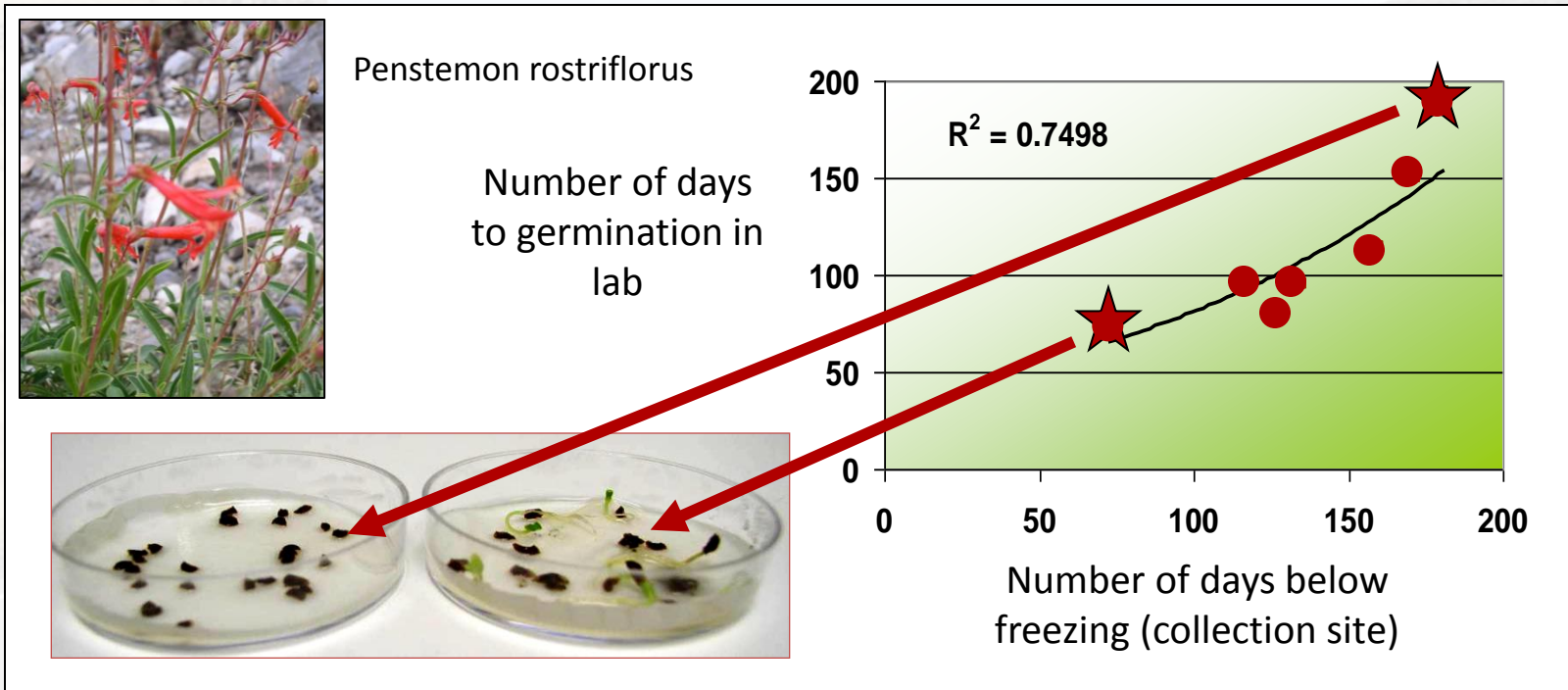
Learning from native 'winners' in degraded sites in the Colorado Plateau



Andrea Kramer
Chicago Botanic Garden
Colorado Plateau Native Plant Program
2012 Annual Meeting, Page, AZ

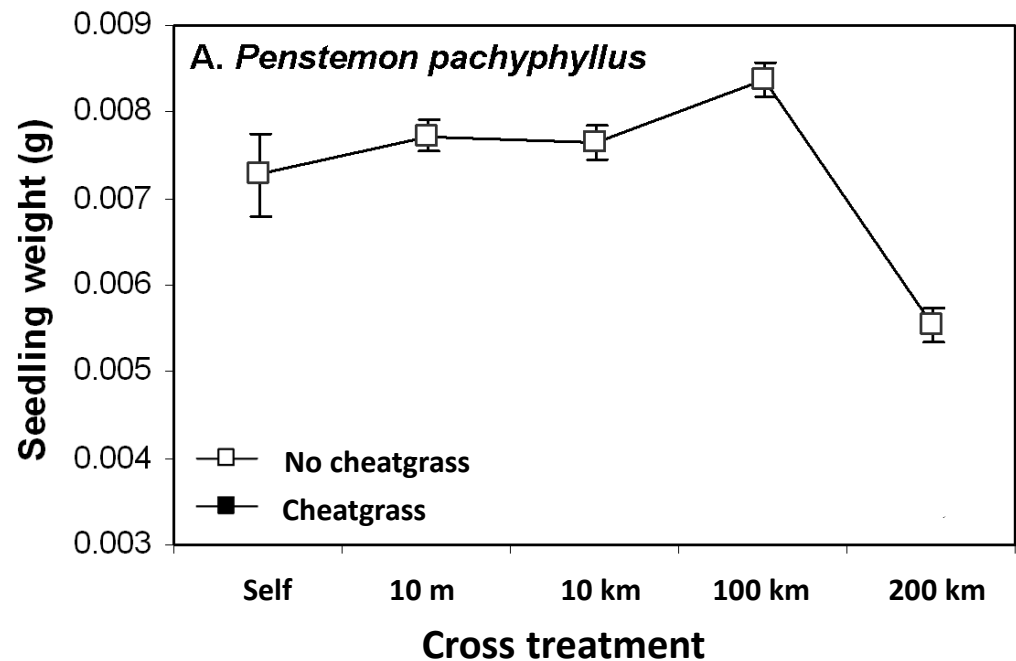
My research background

- Ecological genetics to understand when **provenance** matters for restoration (*Penstemon* in the Great Basin)




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- Ecological genetics to understand when **provenance** matters for restoration (*Penstemon* in the Great Basin)



Recent research on native winners



Competitive ability of native annual forbs
(e.g., Early Seral Species) in invaded sites

Russ Kleinman

Beth Leger's Lab (Univ. of NV-Reno), Brett Wolck & Jayne Jonas (Colorado State), Becky Barak
(Chicago Botanic Garden/Northwestern Univ.)

Recent research on native winners

Evolution of native species in ugly sites

Beth Leger's Lab (University of NV-Reno), Ann Hild and Brian Meador (U of WY)

Recent research on native winners

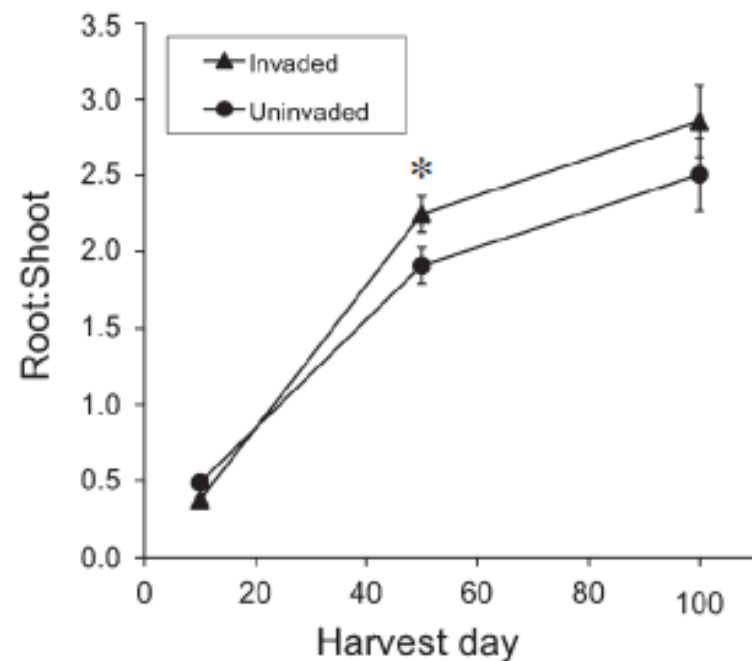
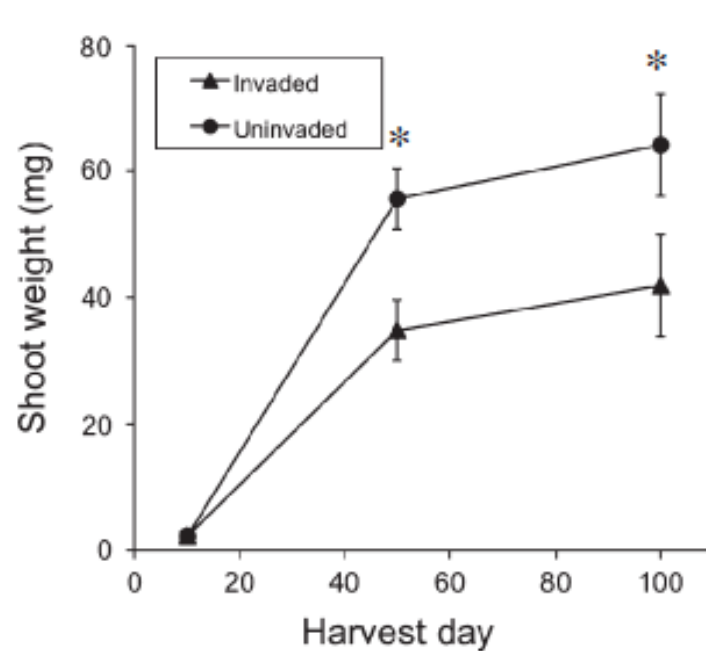
- *Elymus multisetus* persisting & reproducing in sites invaded by cheatgrass >40 years ago



Leger, E. A. 2008. The adaptive value of remnant native plants in invaded communities: an example from the Great Basin. *Ecological Applications* 18: 1226-1235.

Recent research on native winners

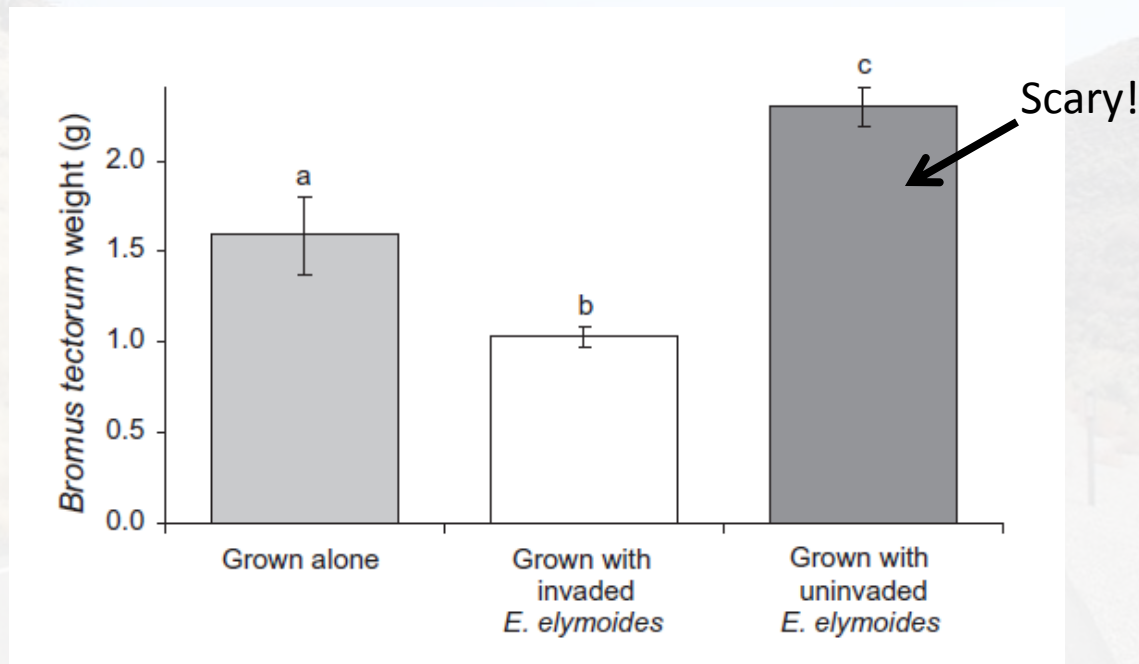
- Plants collected from invaded sites were smaller than plants from uninvaded sites



Rowe, C. L. J., and E. A. Leger. 2011. Competitive seedlings and inherited traits: a test of rapid evolution of *Elymus multisetus* (big squirreltail) in response to cheatgrass invasion. *Evolutionary Applications* 4: 485-498.

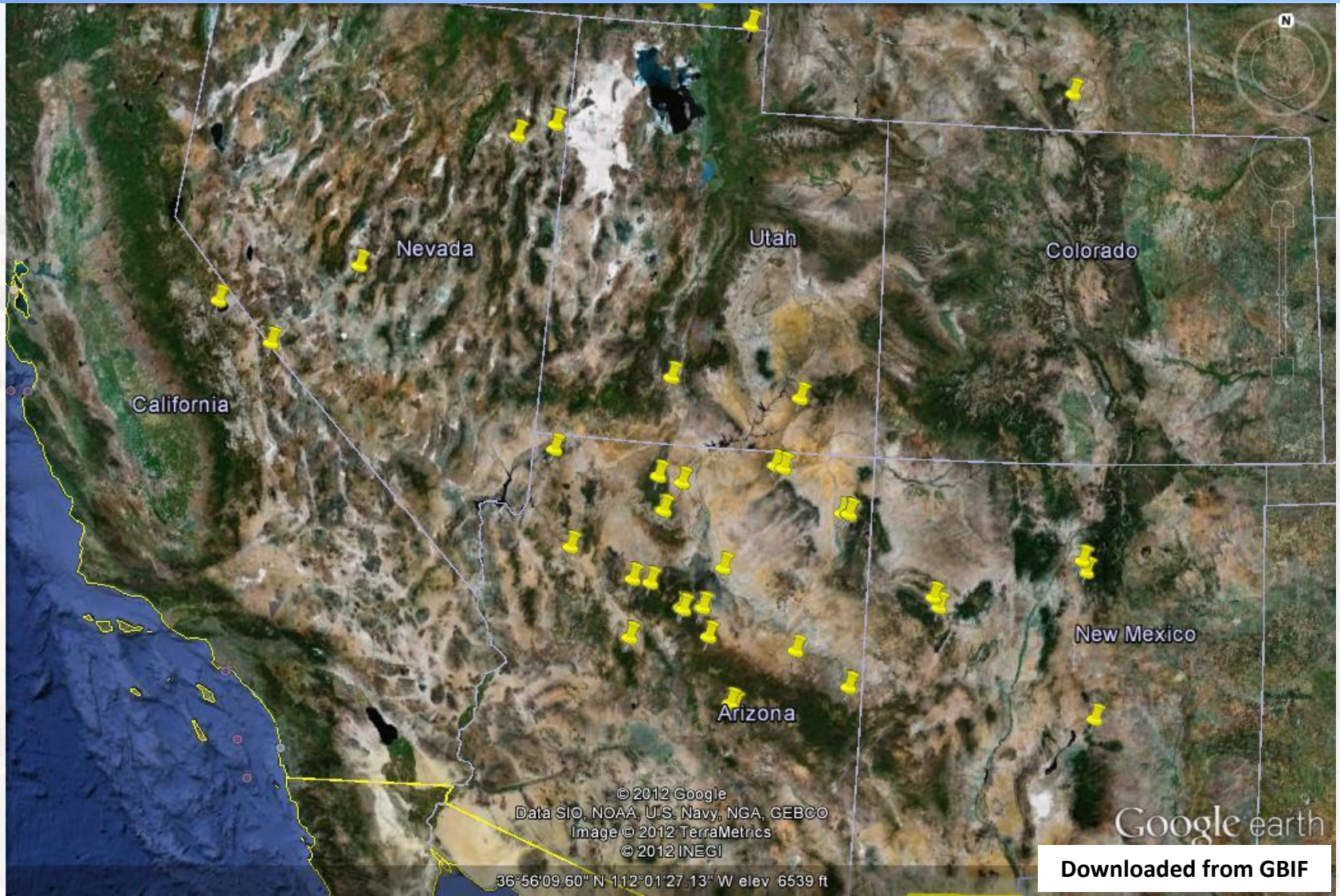
Recent research on native winners

- Plants collected from invaded sites were *significantly* better at suppressing cheatgrass than plants from uninvaded sites



Rowe, C. L. J., and E. A. Leger. 2011. Competitive seedlings and inherited traits: a test of rapid evolution of *Elymus multisetus* (big squirreltail) in response to cheatgrass invasion. *Evolutionary Applications* 4: 485-498.

Finding the native winners

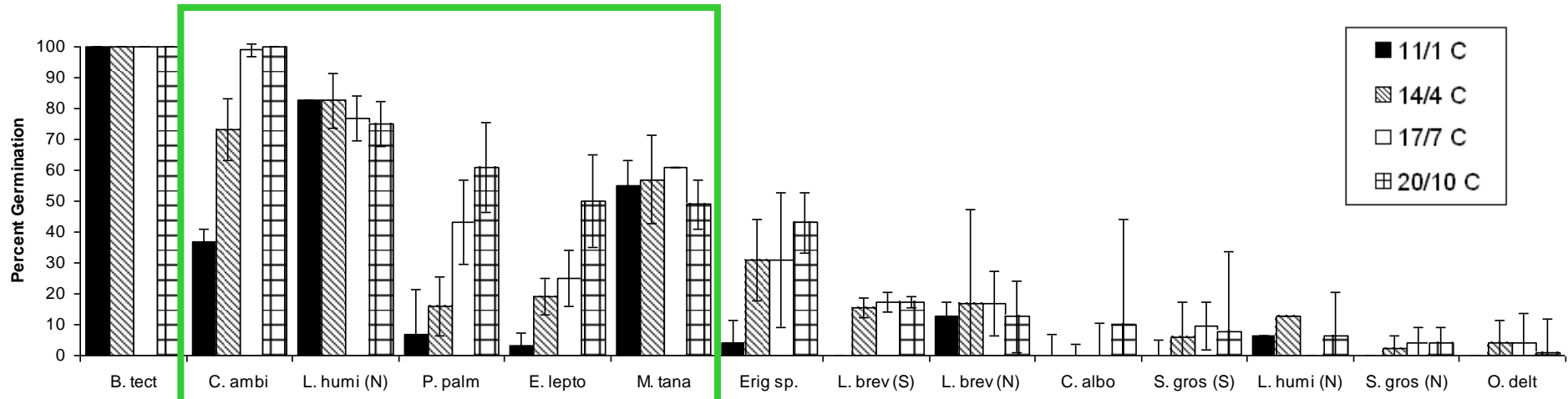


Native species reproducing in ugly sites

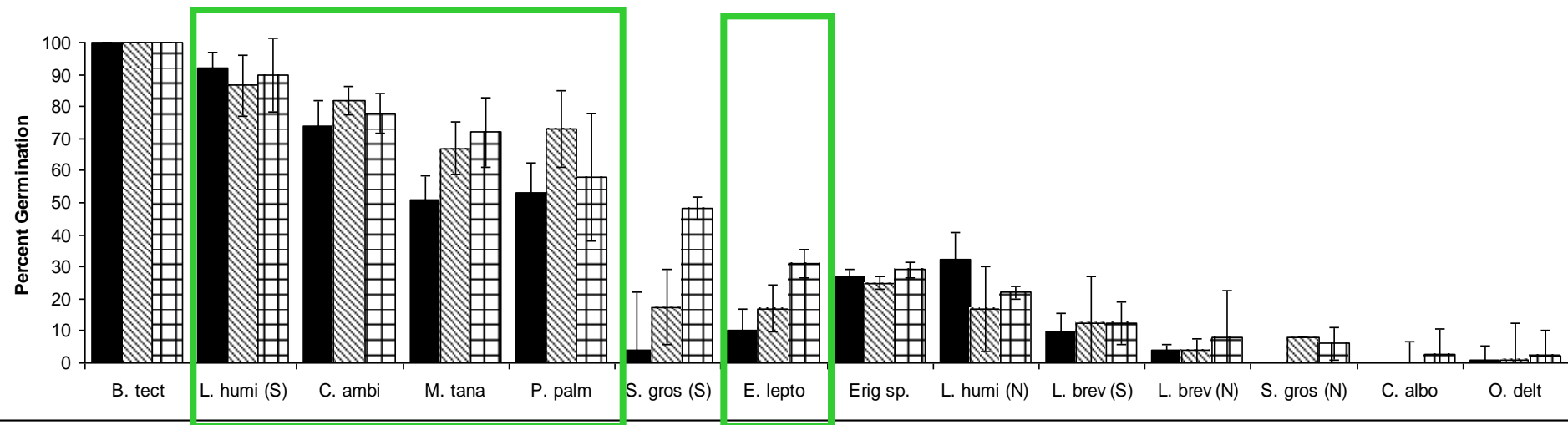
Scientific Name	Common Name	Family	Duration	Collection Site
<i>Chamaesyce albomarginata</i>	Rattlesnake weed	Euphorbiaceae	Perennial	Zion NP, UT
<i>Cryptantha ambigua</i>	Basin cryptantha	Boraginaceae	Annual	Zion NP, UT
<i>Erigeron sp.</i>		Asteraceae	Perennial (?)	Montrose, CO
<i>Eriogonum leptophyllum</i>	Slenderleaf buckwheat	Polygonaceae	Perennial	Montrose, CO
<i>Lotus humistratus</i>	Foothill deervetch	Fabaceae	Annual	Zion NP, UT
<i>Lupinus brevicaulis</i>	Shortstem lupine	Fabaceae	Annual	Zion NP, UT
<i>Machaeranthera tanacetifolia</i>	Tanseyleaf tansyaster	Asteraceae	Annual/Biennial	Zion NP, UT
<i>Oenothera deltoides</i>	Birdcage evening primrose	Onagraceae	Annual/Perennial	Zion NP, UT
<i>Penstemon palmeri</i>	Palmer's penstemon	Plantaginaceae	Perennial	Zion NP, UT
<i>Sphaeralcea grossulariifolia</i>	Gooseberryleaf globemallow	Malvaceae	Perennial	Zion NP, UT

Percent germination after one month

Non Cold Stratified Seeds



Cold Stratified Seeds



Cryptantha ambigua and *Lotus humistratus* had germination percentages that did not differ from cheatgrass under certain conditions.

Collections that germinate with cheatgrass

Scientific Name	Common Name	Family	Duration	Collection Site
<i>Chamaesyce albomarginata</i>	Rattlesnake weed	Euphorbiaceae	Perennial	Zion NP, UT
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Collections that reduce growth of cheatgrass



Flats on day 30



Machaeranthera tanacetifolia growing alone, with one cheatgrass plant, and with four cheatgrass plants. Day 38 (3/12/2012)

Finding the winners

Spring 2012: Locate native species reproducing in ugly sites
Summer 2012: Locate existing collections, make new collections (SOS)

Fall/Winter 2012: Germination and competition trials at Chicago Botanic Garden (add data to Propagation Database)

Fall 2012 through 2014: Sow seeds in common garden trial(s) at degraded sites

2013 – 2014: Determine cultivation potential, protocols for top performers

Recommend for development and use

Questions for you

1. Native species and site suggestions?

- LOCATION: Species native to Colorado Plateau
- SPECIES: Relatively short-lived forbs or grasses growing and reproducing at 'ugly' sites (*not* long-lived species that persist with invasive species or disturbance).
- SITE TYPE: 'Ugly' sites with long-term disturbance (invasive species or other) that you would want to restore.

2. Any existing SOS collections that fit?

Questions for you

1. *Common garden suggestions?*

- LOCATION: Colorado Plateau
- CONDITION:
 - ‘UGLY’: disturbed site (cheatgrass or other) that you would want to restore.
 - ACCESSIBLE: able to be reached by vehicle
 - AVAILABLE: able to have seeds sown fall 2012 and maintained through at least 2014
- SIZE: 100x100 feet

Possible native winners

Taxon	Common name	Type	Where	Competes with?	Reference
<i>Amsinckia menzeisii</i> var <i>intermedia</i>	common fiddleneck	Forb	NV	cheatgrass	Forbis et al. 2009, 2010 GBNPSIP Annual Report
<i>Amsinckia tessellata</i>	bristly fiddleneck	Forb	NV	cheatgrass	Forbis et al. 2009, 2010 GBNPSIP Annual Report
<i>Collinsia parviflora</i>	maiden blue eyed Mary	Forb	UT	burr buttercup	Leger pers comm.
<i>Dalea candida</i>	white prairie clover	Forb			CPNPP Priority Pioneer species
<i>Mentzelia albicaulis</i>	Whitestem blazingstar	Forb			CPNPP Priority Pioneer species
<i>Mentzelia veatchiana</i>	Veatch's blazingstar	Forb	NV	cheatgrass	Forbis et al. 2009, 2010 GBNPSIP Annual Report
<i>Elymus multisetus</i>	Big squirreltail	Grass	NV	cheatgrass	Leger 2008 Ecol. Apps; Goergen et al. 2011. PLoS
<i>Hesperostipa comata</i>	needle and thread	Grass	ID, WY	Russian knapweed, hoary cress	Mealor et al. 2004. Western NA Naturalist
<i>Poa secunda</i>	Sandberg bluegrass	Grass	ID, WY, NV	Russian knapweed, hoary cress, cheatgrass	Mealor et al. 2004. Western NA Naturalist; Goergen et al. 2011. PLoS
<i>Sporobolus airoides</i>	alkali sacaton	Grass	ID, WY	Russian knapweed, hoary cress	Mealor et al. 2004. Western NA Naturalist
<i>Vulpia octoflora</i>	six-week fescue	Grass			CPNPP Priority Pioneer species

Thank you!

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Project Team at Chicago Botanic Garden

- **Dr. Andrea Kramer** - Conservation Scientist, Ecological Genetics
- **Dr. Jeremie Fant** - Conservation Scientist, Molecular Ecology and Lab Manager
- **Dr. Kay Havens** - Director, Plant Science and Conservation
- **Dr. Dan Larkin** - Conservation Scientist, Community Ecology and Curator of Native Habitats
- **Dr. Krissa Skogen** - Conservation Scientist and Manager, Conservation and Land Management Internship Program
- **Becky Barak** - Masters Degree Student, Plant Biology and Conservation Program (Northwestern University and Chicago Botanic Garden)

Support from Bureau of Land Management, Chicago Botanic Garden, Northwestern University, National Fish and Wildlife Foundation

Finding the winners

Locate native species reproducing in ugly sites, collect seed



Identify collections that germinate with cheatgrass



Identify collections that reduce growth of cheatgrass (or at least persist)



Identify collections able to be cultivated for seed production



Recommend for development and use